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United States Department of the Interior
Fish and Wildlife Service

Fishery Leaflet 143

Chicago 54, Ill. September 1945

PREPARATION OF FISH FOR STORAGE IN REFRIGERATED LOCKERS [1/]

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Contents

	Page		Page
Preparing the fish.....	3	Storing the fish.....	10
Packaging the fish.....	8	Shellfish.....	10
Freezing the fish.....	10	References.....	12

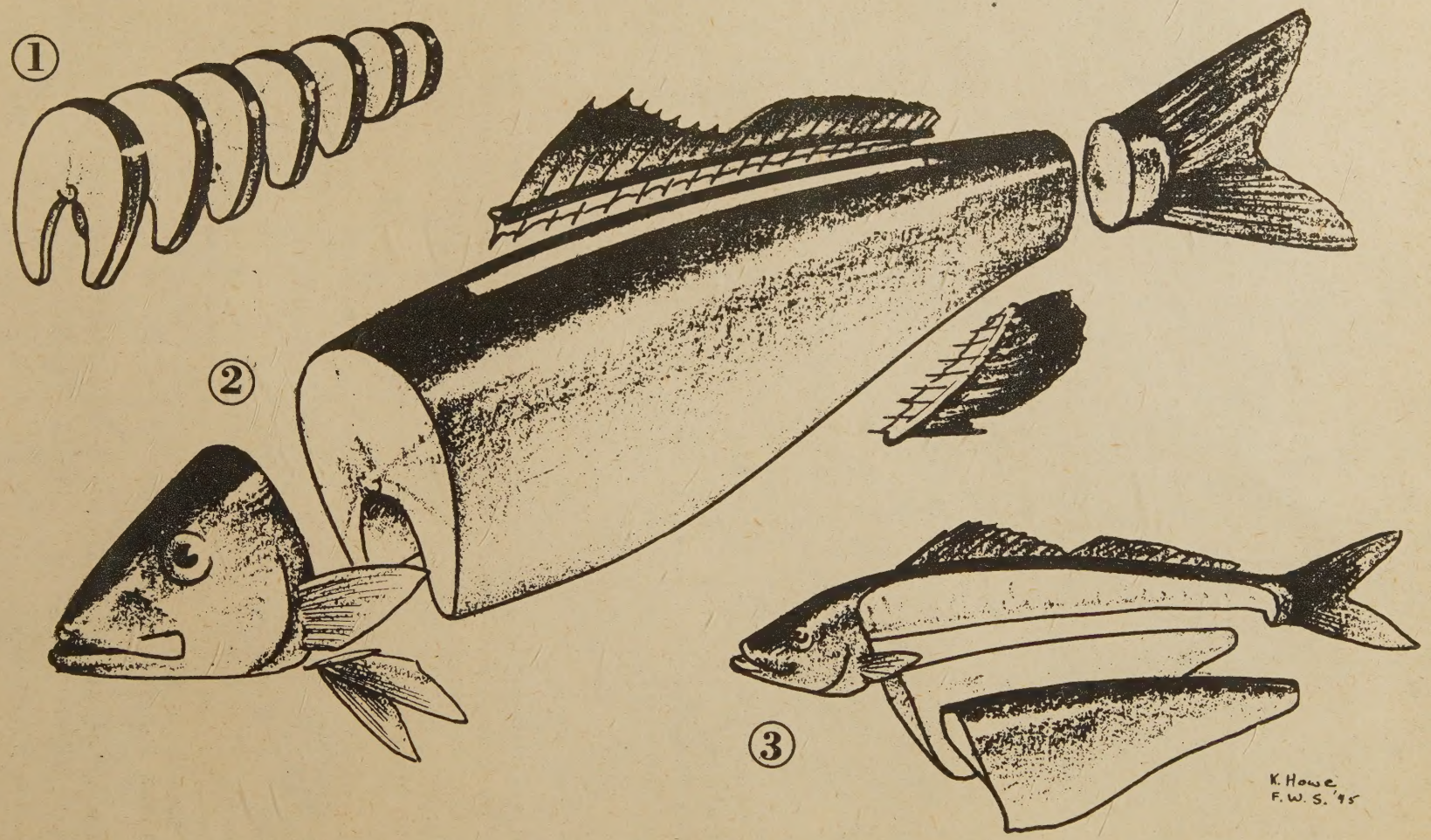
The instructions that follow have been prepared primarily to inform frozen food locker operators and their assistants how to prepare, package, freeze, and store fish in refrigerated lockers. They can be followed equally well, however, by locker patrons and by homemakers who desire to prepare and store fish in home freezer cabinets.

In introducing fishery products to your locker patrons, commercially frozen packaged fish offer you certain advantages. These commodities are more convenient for you to handle and require considerably less care. After you have merchandised these prepared products for a time, you may feel that you are familiar enough with fish so that you can undertake more extensive activities. Then, you may find it more profitable to purchase fresh fish, during their seasons of abundance when they are comparatively economical, and prepare, package, and freeze them for sale to your patrons for storage.

Information to aid you in choosing species during their heavy production periods can be obtained from the Fishery Market News, August 1941 Supplement.

1/ Reprinted from Locker Operator, August 1945, p. 12.

CUTS OF FISH



1. Steaks

2. Dressed

3. Fillets

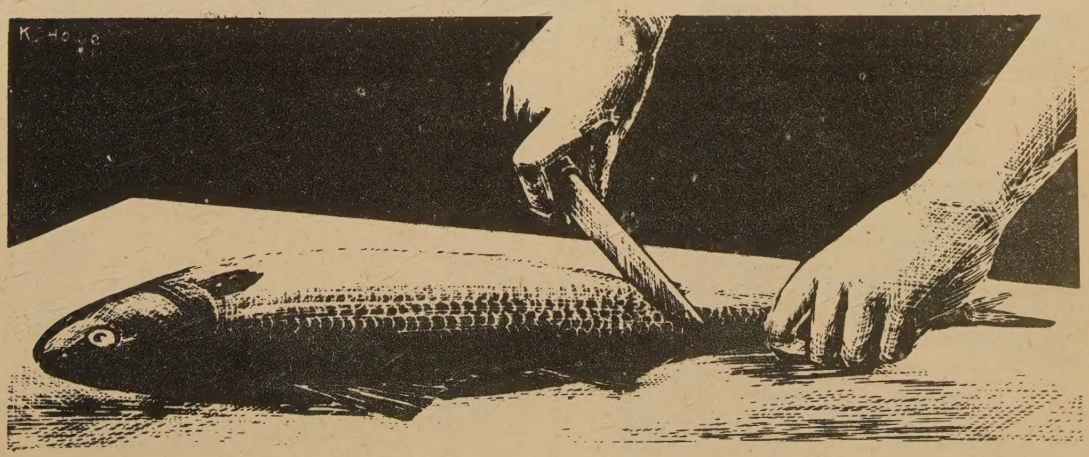
This bulletin also suggests cooking methods, and describes the characteristics of the various species, that is, whether they are fat or lean fish. Request this bulletin from the Fish and Wildlife Service, Washington 25, D. C. More specific production and price data may be obtained from Fishery Market News Service offices located in New York, N.Y.; Boston, Mass.; Chicago, Ill.; New Orleans, La.; Jacksonville, Fla.; Hampton, Va.; San Pedro, Calif.; and Seattle, Wash.

PREPARING THE FISH

For packaging and freezing, purchase fish round (whole) or drawn (eviscerated). It is possible, then, for you to dress, fillet, or otherwise prepare the fish to satisfy your patrons. Fish may be divided into three size groups for the purpose of determining the most suitable means of preparation.

The first group includes fish weighing no more than three pounds. The smallest of these fish--those weighing less than 1 pound--may be frozen whole, if they are exceptionally fresh. For general convenience, however, scale, eviscerate, and head the fish in this group before you wrap, freeze, and store them. Then, when removed from storage, they can be thawed and cooked without any further preparation (see table 1).

Use a narrow-bladed sharp knife to prepare these fish. Remove the scales by scraping gently from the tail toward the head; use the dull edge of the knife, and hold the fish by the tail. For heavy work, or when speed is necessary, use a commercially manufactured electric scaler. You also can use other instruments such as vegetable peelers or similar kitchen "gadgets."



Scaling Fish with a Knife (Use Dull Blade or Back Edge of Knife)

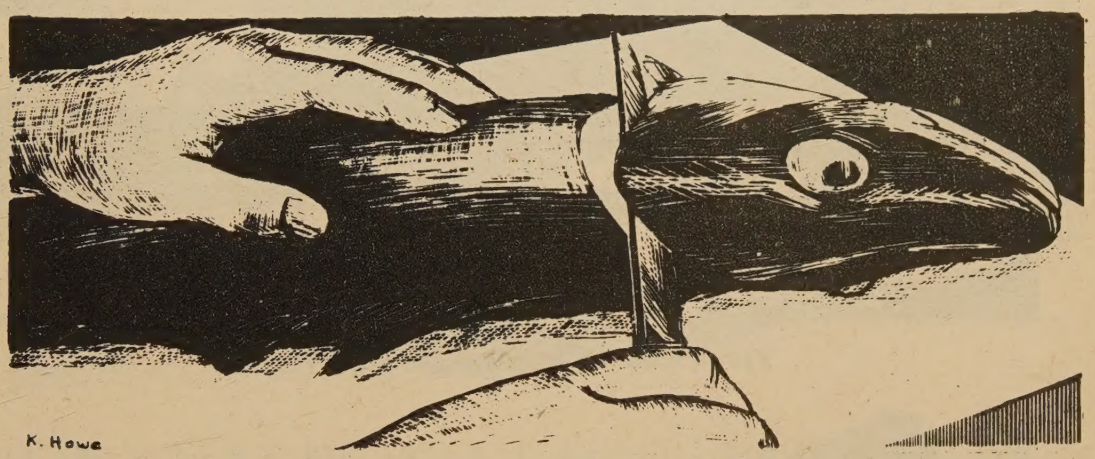
Table 1. METHODS OF PREPARING FRESH AND SALT-WATER FISH FOR LOCKER PLANT STORAGE

Species	Producing area	Market weights pounds	Landed form		Suggested methods of preparation for freezing						Character-istics	Remarks
					Up to 3 lbs.		3 to 7 lbs.		Over 7 lbs.			
			Round	Drawn or dressed	Round	Drawn or dressed	Fillets	Steaks	Steaks	Chunks		
Salt-water species:												
Alewife	Atlantic	½ to 3/4	x	-	x	x	-	-	-	-	Fat	Pickle or smoke
Anglerfish	Atlantic	2 to 20	-	x	-	x	-	x	x	x	Lean	Smokes well
Barracuda	Atlantic & Pacific	5 to 10	x	-	-	-	-	x	x	-	Fat	
Bluefish	Atlantic & Gulf	1 to 7	x	-	-	x	x	-	-	-	Lean	
Blue runner	Gulf	½ to 1	x	-	-	x	-	-	-	-	Lean	
Butterfish	Atlantic	1/4 to 1	x	-	x	x	-	-	-	-	Fat	Smokes well
Cod	Atlantic & Pacific	3 to 20	-	x	-	x	x	-	x	x	Lean	
Croaker	Atlantic & Gulf	½ to 2-1/2	x	-	-	x	-	-	-	-	Lean	
Cusk	Atlantic	3 to 10	-	x	-	-	x	x	x	-	Lean	
Drum, black	Gulf & Atlantic	2 to 20	x	-	-	x	x	x	x	x	Lean	
Drum, red	Gulf & Atlantic	2 to 25	x	-	-	x	x	x	x	x	Lean	
Eel, common	Atlantic & Gulf	1 to 3	x	-	-	x	-	-	-	-	Fat	Smokes well
Eel, conger	Atlantic	5 to 15	x	-	-	-	-	-	-	x	?	
Flounder or "sole"	Atlantic & Pacific	1/4 to 15	x	-	-	x	x	-	x	x	Lean	
Grouper	Gulf & Atlantic	5 to 15	x	x	-	-	x	x	x	x	Lean	
Grunt	Atlantic & Gulf	1/2 to 1	x	-	-	x	-	-	-	-	Lean	
Haddock	Atlantic	1½ to 7	-	x	-	x	x	-	-	-	Lean	Smokes well
Hake	Atlantic	2 to 5	x	x	-	x	x	-	-	-	Lean	
Halibut	Pacific & Atlantic	8 to 75	-	x	-	-	-	-	x	x	Lean	
Herring, sea	Atlantic & Pacific	1/2 to 1	x	-	x	x	-	-	-	-	Fat	Smokes well
Kingfish, Atlantic	Atlantic & Gulf	10 to 30	x	-	-	-	-	-	x	x	Fat	
Kingfish, Pacific	Pacific	3/4 to 1	x	-	-	x	-	-	-	-	Lean	
Lingcod	Pacific	5 to 20	-	x	-	-	x	-	x	x	Lean	
Mackerel	Atlantic & Pacific	3/4 to 3	x	-	-	x	x	-	-	-	Fat	
Mullet	Atlantic & Gulf	1/2 to 3	x	-	-	x	x	-	-	-	Lean-fat	
Oceanpout	Atlantic	2 to 5	x	-	-	x	x	-	-	-	Lean	
Perch, ocean	Atlantic & Pacific	½ to 1-1/2	x	-	-	x	-	-	-	-	Lean	
Pollock	Atlantic	3 to 14	-	x	-	x	x	-	x	x	Lean	
Pompano	Gulf & Atlantic	1 to 1-1/2	x	-	-	x	-	-	-	-	Fat	
Rockfish	Pacific	2 to 5	x	x	-	x	x	-	-	-	Lean	
Rosefish	Atlantic	½ to 1-1/4	x	-	-	x	-	-	-	-	Lean	
Sablefish	Pacific	5 to 15	-	x	-	-	x	x	x	x	Fat	
Salmon	Pacific & Atlantic	3 to 30	-	x	-	-	x	x	x	x	Fat	Some are lean
Scup	Atlantic	1/2 to 2	x	-	-	x	-	-	-	-	Lean	
Sea bass, Atlantic	Atlantic	1/2 to 4	x	-	-	x	x	-	-		Lean	
Sea bass, Pacific, White	Pacific	Up to 50	x	-	-	-	x	x	x	x	Lean	
Sea bass, black	Pacific	50 to 600	x	-	-	-	-	-	x	x	Lean	
Sea robin	Atlantic	3/4 to 2	x	-	-	x	-	-	-	-	Lean	
Sea trout	Atlantic & Gulf	1 to 6	x	-	-	x	x	-	-	-	Lean	
Shad	Atlantic & Pacific	1½ to 7	x	-	-	x	x	-	-	-	Fat	
Shark & grayfish	Atlantic & Pacific	2 to 50	x	x	-	x	x	x	x	x	Lean	
Sheepshead	Atlantic	1 to 15	x	-	-	x	x	-	x	x	Lean	
Smelt	Atlantic & Pacific	¼ or less	x	-	x	x	-	-	-	-	Lean	Eulachon are fat
Snapper, red	Gulf & Atlantic	2 to 15	-	x	-	x	x	-	x	x	Lean	
Snook	Gulf	3	x	-	-	x	x	-	-	-	Lean	
Spanish mackerel	Atlantic & Gulf	1 to 4	x	-	-	x	x	-	-	-	Fat	
Spot	Atlantic	½ to 1-1/4	x	-	-	x	-	-	-	-	Lean	
Striped bass	Atlantic & Pacific	2 to 40	x	-	-	x	x	-	x	x	Lean	
Sturgeon	Atlantic & Pacific	40 to 200	-	x	-	-	-	-	x	x	Fat	
Swellfish	Atlantic	1/4 to 1	-	x	-	x	-	-	-	-	Lean	
Swordfish	Atlantic & Pacific	50 to 200	-	x	-	-	-	-	x	x	Lean	
Tautog	Atlantic	2	x	-	-	x	-	-	-	-	Lean	
Tilefish	Atlantic	4 to 18	-	x	-	-	x	-	x	x	Lean	
Tomcod	Pacific & Atlantic	1/2 to 1	x	x	-	x	-	-	-	-	Lean	
Tuna	Pacific & Atlantic	10 to 65	x	-	-	-	-	-	x	x	Fat	Short storage period
Whiting	Atlantic	1/2 to 1½	x	-	-	x	-	-	-	-	Lean	
Wolffish	Atlantic	2 to 25	-	x	-	x	x	-	x	x	Lean	
Fresh-water species:												
Bowfin	Lakes & rivers	2 to 8	x	-	-	x	-	x	x	-	Lean	Smokes well
Buffalofish	Mississippi valley	5 to 15	x	-	-	-	-	x	x	-	Lean	Smokes well
Burbot	Great Lakes	3 to 10	x	-	-	x	x	-	-	x	Lean	
Carp	Lakes & rivers	2 to 8	x	-	-	x	-	x	x	x	Lean to fat	Smokes well
Catfish & bullhead	Rivers & lakes	1 to 10	x	-	-	x	-	x	x	x	Fat	Smokes well
Lake herring	Great Lakes	½ to ¾	x	-	x	x	-	-	-	-	Lean to fat	Smokes well
Lake trout	Lakes	1½ to 10	-	x	-	x	x	-	x	x	Fat	
Pickerel or pike	Great Lakes	2 to 10	x	-	-	x	x	-	x	x	Lean	
Pike perches & yellow perches	Great Lakes	1/2 to 10	x	-	-	x	x	-	x	-	Lean	
Sheepshead	Lakes	1/2 to 3	x	-	-	x	x	-	-	-	Lean	
Smelt	Great Lakes	Less than ½	x	-	x	-	-	-	-	-	-	
Suckers	Great Lakes & streams	1/2 to 4	x	x	-	-	x	-	-	-	Lean	
Sunfish	Lakes	1/4 to 3/4	x	-	x	x	-	-	-	-	Lean	
Whitefish	Great Lakes	2 to 6	x	x	-	x	x	x	-	-	Fat	Smokes well

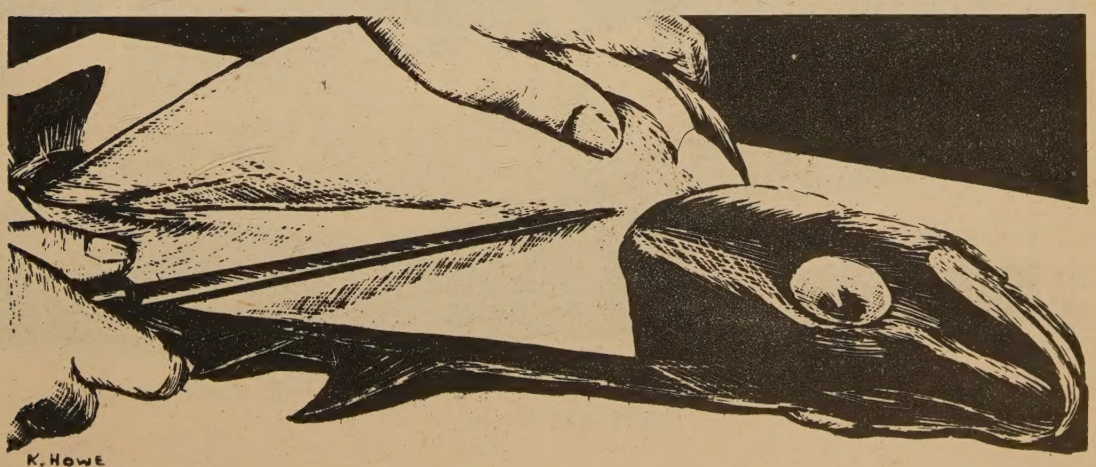
Remove the entrails by cutting the entire length of the belly from the vent (anal opening) to the head; take care not to cut the viscera by inserting the point of the blade too far. Remove the viscera by hand, and then cut off the head. Carefully remove traces of blood and viscera from the belly cavity, and, if necessary, wash the fish inside and out with a damp cold cloth.

The second group includes fish weighing from 3 to 7 pounds. These fish are well suited for filleting before packaging and freezing although some of the smaller ones may be prepared as dressed fish, according to the instructions for the first group (see table 1).

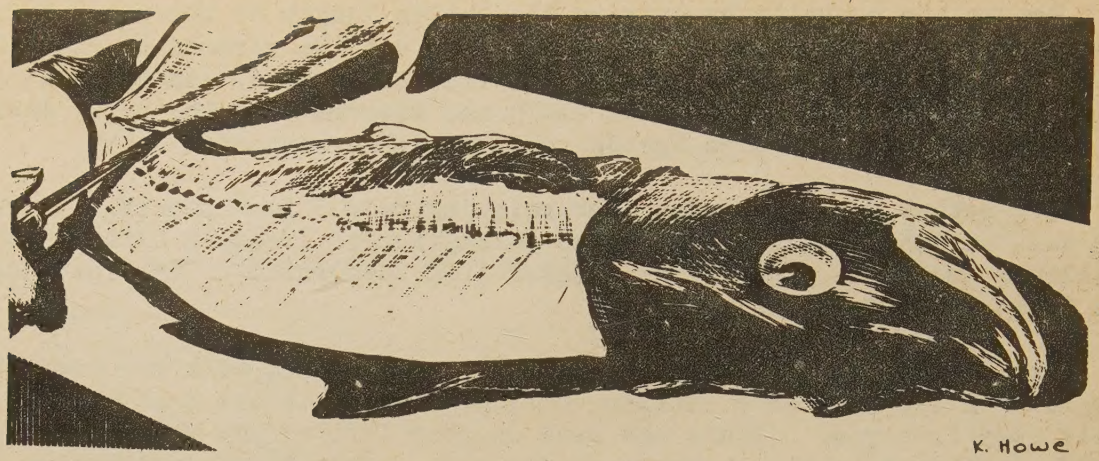
Use a sharp knife to fillet the fish. If you cut with the right hand, lay the fish on its side on a cutting board or table with the head at your right, belly away from you. (Place the head on your left if you cut with the left hand). Cut down to the backbone at the neck. When the knife reaches the backbone, turn the knife flat and cut the flesh along the bone to the tail, exerting a steady pushing pressure. Lift off the entire side in one piece. Turn the fish over and around, and repeat the operation on the other side, freeing the fillet by cutting from head to tail. Pull out with your fingers any small bones that cannot be removed readily with the backbone, or trim them off with your knife.



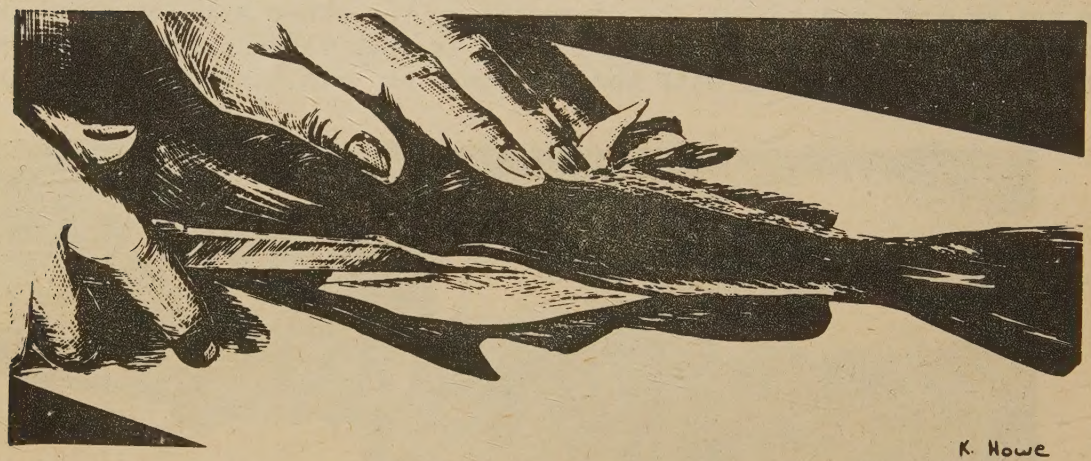
Filleting - First cut made at neck or collarbone



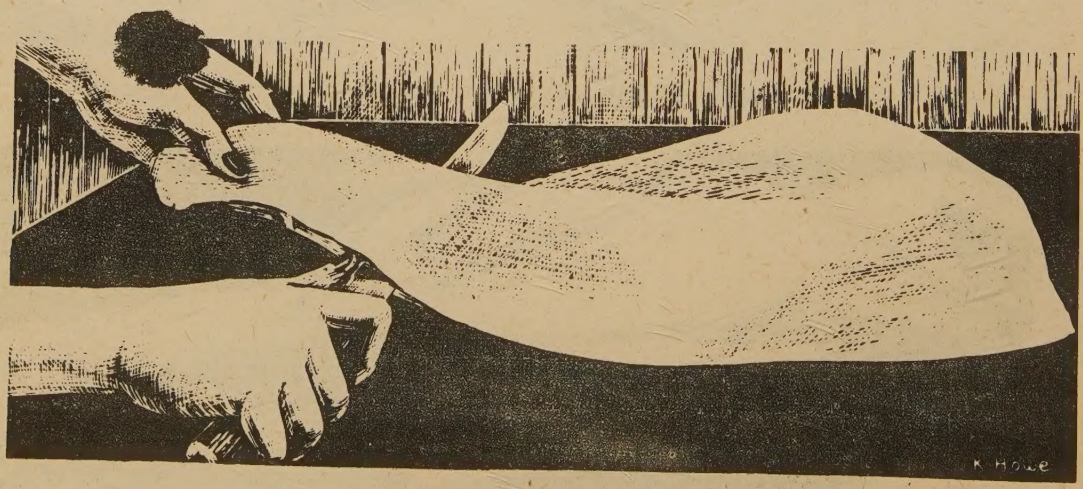
Cutting along backbone - to remove fillet



Freeing fillet at the tail



First cut to remove second fillet

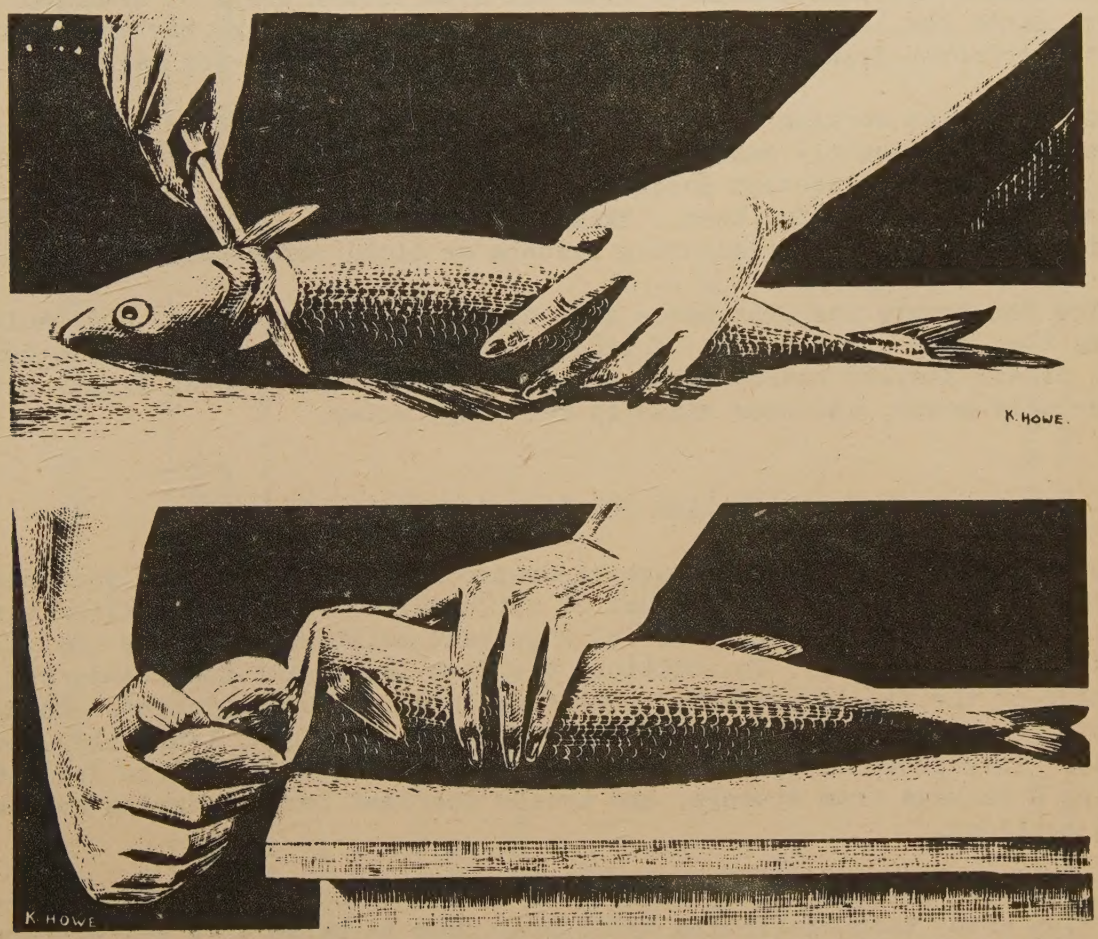


Remove the skin from the fillet

If you wish, you can skin the fillets, too. Lay the fillet flat on the cutting board or table with the flesh side up. Hold the tail-end with your fingers, and with your knife cut through the flesh to the skin about one-half inch in from the end of the fillet. Flatten your knife on the skin, and cut the flesh away from the skin by pushing your knife forward while holding the free end of the skin firmly between your fingers.

The third group includes fish weighing over 7 pounds (see table 1).

Dress large fish by removing the scales, viscera, heads, and tails. From some it may be advisable to remove the fins, too, especially if they are large or sharp. Remove the head, after scaling and eviscerating the fish, by cutting down to the backbone with a sharp knife at a point on the neck above the collarbone. If the backbone is not too large, remove the head by cutting through the backbone with a single stroke. If the bone is large, cut down to it on each side of the fish, and then snap the backbone by bending it over the edge of the cutting board or table. If necessary, cut through any remaining pieces which may hold the head attached to the body.



Remove head by cutting above collarbone and breaking backbone at table edge

Remove the back fins by cutting into the flesh along each side of the fins with the point of your knife, and remove the fins with your fingers by pulling toward the head. The fins and attached bones thus will come free. Remove the other fins by cutting them away with a small portion of the flesh and internal bones. Never trim the fins with shears.

After scaling, finning, eviscerating, and heading large fish, prepare steaks by cutting vertically through the body into slices about one inch thick. It will be necessary sometimes for you to search out joints along the backbone in order to cut through with a minimum of difficulty. The tail portion of large fish is usually filleted or cut into chunks when the steaks become too small.

Prepare chunks from large fish by cutting the dressed fish into thick portions in the same manner as for steaks. Cut the pieces several inches or more wide, perhaps dividing the dressed fish into fourths or fifths. The size of the chunks should depend somewhat on the future use and characteristics of the species. In order to increase the storage life it is wise to cut fat fish into larger pieces.

In commercial practice large fish are also frozen whole or dressed. For locker plants the latter method would be preferable. Steaks may be sawed or cut from these frozen fish at a convenient period and packaged for sale.

When you are working with fish, keep your cutting board or table as clean as possible. Frequently wash and remove adhering viscera, fins, and bones. Such care is necessary to prevent possible contamination of your fish, and will result in longer storage life for them. Examine carefully your dressed or filleted fish, and free them, too, of any adhering viscera or blood before wrapping them.

You can remove the fish odors from utensils, cutting board, and table by washing them with a hot brine. A tablespoonful of salt dissolved in a quart of water, or any similar ratio, makes a satisfactory brine. Wash, first, with the hot salt-water, and then rinse in hot soapy water.

PACKAGING THE FISH (See table 2)

Use wrappers that are moisture-vapor-proof and wrap and seal your packages so that the smallest possible amount of air remains. Use heat-sealing cartons to hold these packages. Wrappers which prevent moisture loss keep the fish from dehydrating, and if, in addition, the fish are packed to exclude air, oxidation of the fat is prevented. Storage life is thus prolonged. Whenever, possible, wrap the fish in portions of a size to serve one, two, three, or four persons. This procedure permits choosing the exact amount of fish desired when removing a package from storage, and avoids the need for uncovering and rewrapping unused portions.

Large fish are frequently glazed and stored without wrappings. Glaze these fish after they are frozen by dipping them in water at a temperature near

Table 2. SUGGESTED PACKAGING METHODS FOR FISH IN LOCKER PLANT STORAGE

Size	Moisture-vapor-proof wrapper*	Glass jar	Cup container	Glaze	Remarks
Up to 3 pounds					
Small sizes:					
Round	x	x	x	-	In this group are those
Drawn or dressed	x	x	x	-	weighing less than 1 pound
Large sizes:					
Round	x	-	-	-	In this group are those
Drawn or dressed	x	-	-	-	weighing from 1 to 3 pounds
3 to 7 pounds					
Fillets	x	-	-	-	
Steaks	x	-	-	-	
Round	-	-	-	x	Only the largest fish in this
Chunks	x	x	x	-	class should be glazed.
Over 7 pounds					
Steaks	x	-	-	-	
Chunks	x	-	-	-	
Round	-	-	-	x	

* Use heat-sealing cartons, in which you can place several moisture-vapor-proof wrapped packages, for packaging efficiency and increased storage life.

freezing or about 34-degrees Fahrenheit. Glazing should be done in a cool room. After the first coat or glaze freezes, repeat the dipping twice more allowing each coat to freeze first. If the fish are stored for more than two months, glaze them again.

FREEZING THE FISH

Numerous articles have been written about the relative merits of various types and speeds of freezing. Experts, however, have agreed that freezing must follow quickly after preparation and packaging to prevent spoilage at high temperatures. Some believe that the most rapid freezing possible is desirable because smaller ice crystals form in the flesh and cell tissue rupture is lessened, thus minimizing moisture loss (drip) during thawing. Therefore, freeze your fish at 0-degrees Fahrenheit, or lower, depending upon the type of equipment you are using. Package them in small enough quantities so that they will freeze in 24 hours or less.

STORING THE FISH

The important factors governing the length of storage life of fish and their quality afterwards are the effectiveness of packaging, the storage temperature, and the characteristics of the flesh.

If you use a moisture-vapor-proof wrapper and a sealed package containing a minimum of air, you retard desiccation as well as oxidation, or the development of rancidity. The oxidation or rancidity is caused by the air coming in contact with the oil or fat in the fish, and tends to discolor the flesh although it does not make it inedible. Palatability is reduced, however, and the quality is not as desirable as it might be. You will reduce the possibility of this unfavorable change taking place and increase the storage life by many weeks through proper packaging.

For optimum storage life maintain a constant holding temperature of 0-degrees Fahrenheit. Fluctuating temperatures are unfavorable, and usually cause desiccation. You should prevent variations of more than two degrees, plus or minus.

Store lean-meated fish for as long as one year but provide for more rapid turnover, whenever possible. The storage life of fatty fish will vary; generally, a six months period is considered the maximum. You should not store some fish for more than a few weeks, especially when they are exceptionally rich in fat.

Certain trade periodicals have reported that the average turnover of foods in lockers has been about three times yearly. Suggest this to your patrons as the rule rather than the exception for fish, and, thereby, you will assure them of good eating.

SHELLFISH

You also can freeze and store oysters, shrimp, lobsters, clams, crabs, and other shellfish (see table 3). Shucked oysters, raw or cooked shrimp, and fresh-

Table 3. METHODS OF PREPARING SHELLFISH FOR LOCKER PLANT STORAGE

Name	Producing Area	Market form				Suggested method of preparing			Characteristics
		Whole	Shucked, headed, or dressed	Cooked in shell	Cooked meat	Shucked, headed, or dressed	Cooked in shell	Cooked meat	
Abalone	Pacific	-	x	-	-	x	-	-	Lean
Clams	Atlantic & Pacific	x	x	-	-	x	-	-	Lean
Crabs	Atlantic & Pacific	x	-	x	x	-	x	x	Lean
Lobsters	Atlantic	x	-	x	x	-	x	x	Lean
Mussels	Atlantic	x	x	-	-	x	-	-	Lean
Oysters	Atlantic, Gulf, and Pacific	x	x	-	-	x	-	-	Lean
Scallops	Atlantic	-	x	-	-	x	-	-	Lean
Shrimp	Atlantic, Gulf, and Pacific	-	x	x	x	x	x	x	Lean
Spiny lobsters	Atlantic & Pacific	x	x	x	x	-	x	x	Lean
Other Prod.									
Frogs	Louisiana & Florida, some in other states	x	x	-	-	x	-	-	Lean
Turtles	Atlantic, Gulf, and Mississippi	x	x	-	-	x	-	-	Lean

Note: Clams, crabs, lobsters, mussels, oysters, and spiny lobsters, when purchased in shells, should be alive, unless cooked. Shrimp are usually marketed with the heads removed; frogs are usually marketed as legs only; and turtles are usually marketed as steak meats, or chunks of meat for soups.

Table 4. SUGGESTED PACKAGING METHODS FOR SHELLFISH IN LOCKER PLANT STORAGE

Prepared form	Method of packaging			Remarks
	Moisture-vapor-proof wrapper*	Glass jar	Cup container	
Shucked, headed, or dressed	-	x	x	Use containers which will prevent loss of juices.
Cooked in shell:				
Small shellfish	-	x	x	Wrap carefully so that shell does not puncture paper.
Large shellfish	x	-	x	
Cooked Meat	-	x	x	

* Use heat-sealing cartons whenever possible.

cooked crab meat, as well as other shellfish, are frozen and packaged commercially, and you can obtain these products for storage and sale in your locker plant. See table 4 for packaging instructions. Shellfish are frozen and stored in the same manner as fish.

Lists of processors and wholesalers of these and other frozen packaged fishery products are available, and may be obtained upon request from the Fish and Wildlife Service.

In order to foster a better understanding of the care and handling of fish the Fish and Wildlife Service, through its Division of Commercial Fisheries, is prepared to assist locker plant operators, State Locker Associations, and others with their fishery problems. Division marketing specialists, technologists, and home economists will cooperate in fulfilling requests for prearranged demonstrations dealing with the preparation of fish for locker storage, and home cookery of fishery products. The Service will be glad to increase and develop a market for fishery products in refrigerated food locker plants in this manner.

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